



Issues & Directions

Health Services Utilization and Research Commission

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Emergency Medical Response in Rural Saskatchewan: A Framework for Evaluating Effectiveness

Abstract

Recent reports have called for changes to the delivery of emergency medical services in Saskatchewan. The research evidence in the area, however, focuses on specific components. This paper aims to stimulate discussion about how this evidence can be brought together to define the optimal design for an overall emergency system that achieves the best possible patient and population outcomes.

After reviewing the limited literature on emergency system design and evaluation, and consulting with stakeholders across the province, a Health Services Utilization and Research Commission (HSURC) working group developed a framework for evaluating emergency medical response in rural Saskatchewan. Related to the proposed framework, the Commission recommends system stakeholders agree on the goals of emergency medical response; define measures of success in achieving those goals; identify existing tools for collecting data and, where required, develop new ones; and collect and analyze reliable and valid data.

Background

A 1999 survey conducted by HSURC found access to emergency medical services (EMS) was a key concern for many rural Saskatchewan residents. More recently, reports by Keller and Cross (Saskatchewan EMS Development Project, 2000), Fyke (Caring for Medicare: Sustaining a Quality System, 2001), and the Province of Saskatchewan (The Action Plan for Saskatchewan Health Care, 2001) have all called for changes to the delivery of emergency medical services.

Keller and Cross recommended significant changes to the configuration and supply of emergency medical services. Fyke supported their recommendations—particularly those related to improved and standardized response times, training levels, and fees—and the government's subsequent response included actions in each of these areas. All three reports flagged inconsistency in the quality of emergency medical services across the province.

Despite these calls to improve emergency medical services in this province, we know very little about the effectiveness of different models of service delivery. Many stakeholders believe there is already sufficient evidence to begin reorganizing current structures and activities. However, while there is plenty of research on individual components of EMS, there is little evidence that pulls together these separate pieces to spell out what works from a "systems" perspective. No studies explain how the evidence on individual components of emergency care applies to the overall delivery of service in rural areas. Missing also is consensus across stakeholder groups—including the public—about what the overall goal of emergency medical response in rural areas should be.

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HSURC has been involved in research on emergency medical services since early 1997. We prepared a discussion paper on solutions to non-urgent use of emergency departments, conducted a pilot study examining the feasibility of using electronically collected ambulance data for research or system evaluation, and reviewed the research and evaluation literature on rural emergency medical services.

Through this work, we found:

- there is no single, evaluated solution to curbing non-acute use of emergency departments;
- pre-hospital rural EMS systems are, for the most part, not evidence-based;
- there are few best practices in rural EMS delivery identified in the literature; and,
- generally, our provincial ambulance data is comprehensive and valid and could be used for research or evaluation.

In 2000, we formed a working group of individuals involved in emergency medical services, to review the available evidence and identify ways to create a more effective emergency medical response system for rural Saskatchewan. For the purposes of this project, we defined as rural any Saskatchewan community outside of Saskatoon and Regina. The challenges faced by smaller communities in providing emergency medical response are markedly different than circumstances in the province's two largest centres.

We recognize, however, that while Saskatchewan rural communities share many similarities, they have, at the same time, many significant differences. Communities in this group come in a wide range of sizes (from villages with five residents, to cities with almost 35,000 people), are serviced by many different emergency medical response structures (26 dispatch centres, 111 separate ambulance services), and support four different categories of hospitals.

This paper provides an overview of research evidence we found on effective emergency medical response systems and practices, and is intended to stimulate discussion about system design and evaluation. It also presents a framework developed by the working group that is intended to serve as a starting point for evaluating rural emergency medical response services to ensure they are achieving optimal patient/population outcomes.

What we did

This project focuses on emergency medical *response* rather than emergency medical *services*. Emergency medical response refers to actions taken in response to acute emergency situations outside of hospital, and it is an important part of the wider emergency medical services system. Patient transfer and health promotion/injury prevention play a significant role in health outcomes, but are more appropriately considered as part of a discussion of the overall emergency medical services system.

1. Research evidence on effectiveness of emergency medical services

We originally reviewed the literature in 1997, and again in 2000, for published research evidence on optimal delivery of emergency medical services in rural areas. In 2002, we went back to the literature to find research evidence on patient/population outcomes related to pre-hospital emergency care. We identified published and unpublished material through database and on-line keyword searches, and by reviewing electronic bulletin board discussion groups, and reference lists.

2. System design and evaluation

Through a brainstorming exercise and survey, members of our working group identified goals for an emergency medical response system. We supplemented this with evidence identified in our review of the literature on design and evaluation of EMS systems. Based on this information, HSURC research staff then developed a framework that defines the specific components and interactions that contribute to an effective system.

In drafting the framework, we reviewed the strategic organizational plans of various emergency medical systems in Canada and the United States. We sent our completed draft framework to key stakeholders for their feedback.

The framework defines the specific components and interactions that contribute to an effective system.

What we found

1. Research evidence on effectiveness of emergency medical services

The literature on EMS covers a diverse range of topics, ranging from broad-based reviews of emergency medicine to evaluations of very specific issues such as defibrillation. Although the individual aspects of an EMS system play a smaller role in determining patient outcomes than does the design and coordination of the system as a whole, most of the research in the area focuses on these

single components (such as communications, dispatch, transport). A major obstacle to evaluation is the lack of accessible, reliable, linked data with which to conduct ongoing reviews of the impact of system and individual performance on patient outcomes.

Beyond the key findings listed in Table 1 most of the research on EMS is inconclusive. This is, in part, because study designs do not take into account or control for relevant system variables (such as structures and policies). Table 2 outlines gaps in EMS research. Our review of published literature indicates there is still much to learn about rural emergency medical response.

Table 1

WHAT DO WE KNOW FROM THE LITERATURE?
Relieving discomfort is more meaningful than mortality as an outcome indicator for emergency medical response; death is the most commonly used outcome measure, but is not the typical outcome in emergencies.
Failure to recognize emergency medical situations results in slower response times.
Much use of the current emergency system is not for medical emergencies.
Rural EMS systems are vastly different from urban ones, in terms of • <i>Geography</i>: Because rural residents live in isolated areas that often are not well marked, it can take several hours to locate an injured victim (e.g., in a farm field). • <i>Client-population profile</i>: Rural areas tend to have older residents. • <i>Type of emergencies</i>: More severe motor vehicle traumas and farming-related injuries occur outside urban areas. • <i>Nature of the setting</i>: Rural jurisdictions are characterized by a combination of large geographic areas, low call volumes, and low call acuity, conditions for which Advanced Life Support (ALS) systems are generally not indicated. • <i>Loss of skills</i>: Low call volumes spread over a large base of volunteer and paid personnel, as is the case in rural areas, has been shown to reduce responders' ability to use EMS skills. • <i>Level of training</i>: Medical response in rural areas is generally provided by volunteer first responders or emergency personnel with Basic Life Support (BLS) training only. • <i>Access</i>: Many areas do not have 911 service or a seven-digit emergency access telephone number.
Pre-hospital defibrillation improves survival in patients with ventricular fibrillation.
The availability of organized trauma systems (including trauma facilities and triage protocols) improves survival among victims of major traumas.

Table 2

WHAT ARE THE GAPS IN THE RESEARCH?
"Best practices" in rural EMS delivery
The costs of emergency care and the cost effectiveness of EMS
Outcome measures related to the level of morbidity following injury or illness
Links between the provision of emergency care prior to arrival at the emergency department with improved patient outcomes
Information about the care provided after transport to hospital provides information on outcomes, as pre-hospital care is only one part of the continuum of care, and requires linking data from EMS with emergency department, inpatient, outpatient, and autopsy records
Research that is available focuses on a single health condition or operational issue not necessarily generalizable to other conditions or operations
Research that specifically explores the effectiveness of transport protocols
Validated dispatch and field time interval standards
The effect of distance on health outcomes
The relationship of provider of care to outcomes; evaluations of desirable attributes (in terms of numbers of providers and combined levels of education and experience to provide specific services or interventions) related to patient outcomes

2. System design and evaluation

The literature we located about measurable goals and objectives of Canadian and American emergency medical services systems suggests an effective emergency medical response system has four qualities:

- It will provide to all medical emergencies timely and effective response that is consistent with the evidence;
- It will have a culture characterized by quality improvement principles, concepts, and values;
- It will be sensitive to (and able to meet) the changing needs of the community; and,
- It will be based on management systems and strategies that support fiscal sustainability.

Creating the framework: Defining goals and activities of emergency medical response

We consulted with the EMS project working group and key stakeholders on appropriate goals for an emergency medical response system in rural Saskatchewan. They told us the ultimate goal of emergency medical response is to respond effectively to a medical emergency situation—when immediate medical attention is required, when the situation cannot safely be delayed, and when transportation cannot be provided by untrained people. Working group members and other key informants agreed that by responding effectively to an emergency situation, the emergency medical response system should be able to decrease death and disability. This, in turn, can improve the health status of the community and thus, contribute to rural community viability and well-being.

During these discussions, we encouraged participants to think about innovative ways to achieve these goals and to consider five key dimensions of effectiveness: equity, accessibility, acceptability, relevance, and efficiency. (These dimensions were identified by HSURC in its earlier research on system performance indicators.) We based our framework on five key dimensions because the themes we identified in our review of the literature on EMS system design and evaluation also address them. See Table 3 on page 8 for an illustrative example of the EMS project working group's definitions of each of these dimensions and how they relate to emergency medical response.

Why the framework?

A system design and evaluative framework is critical to ensuring that rural emergency medical response is delivered effectively and efficiently. At present there are no explicit definitions of what a rural emergency medical response system in Saskatchewan should accomplish. Nor did our literature review yield sufficient evidence about what contributes to effective emergency medical response in a rural setting.

Emergency Medical Res

Services contribute to rural

Impact positively on

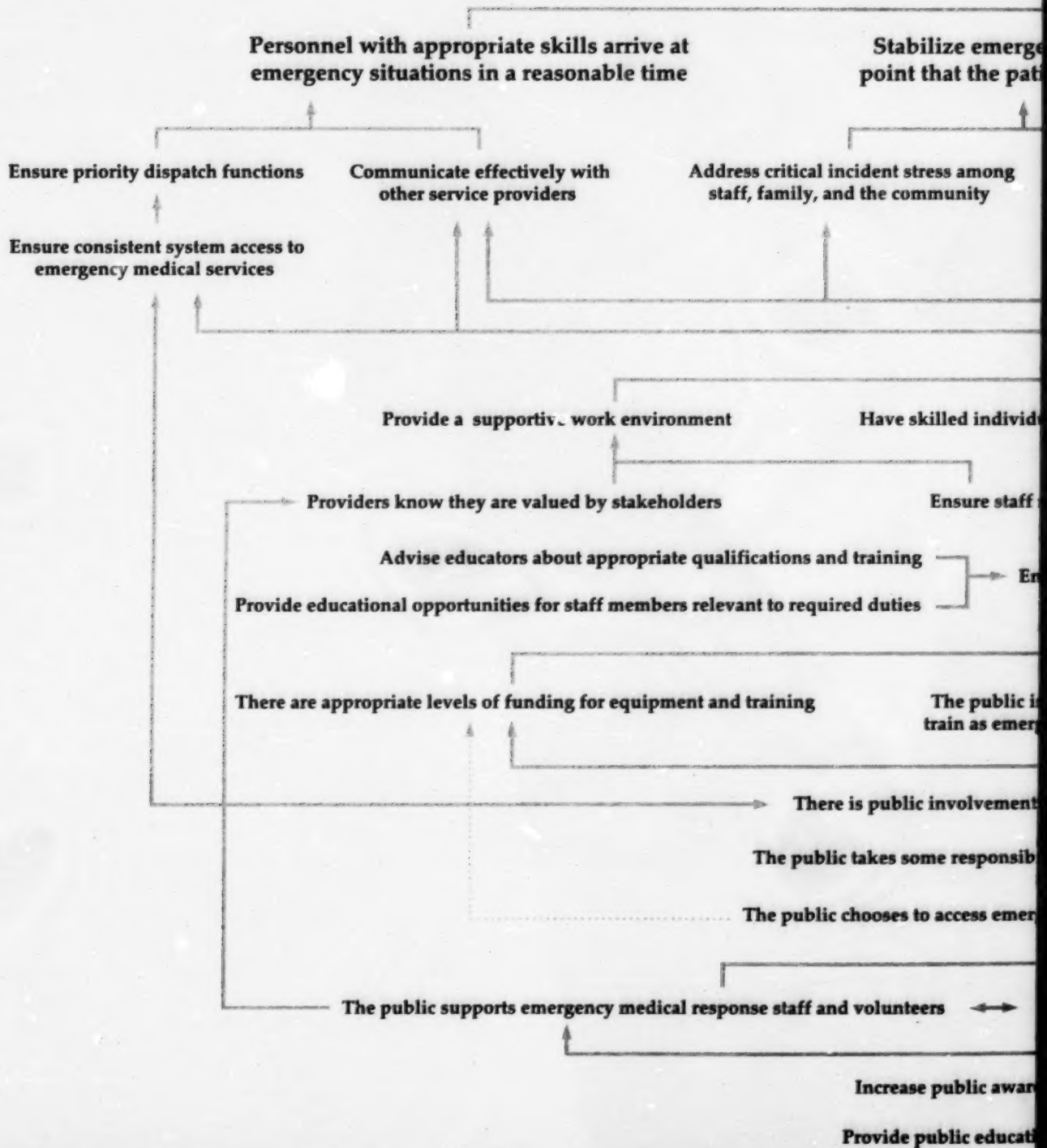
Decrease d

EQUITY

ACCESSIBILITY

A

Respond effectively to



in Rural Saskatchewan

community viability and well being

status of community

disability ↔ Improve long term population outcomes

BILITY RELEVANCE EFFICIENCY

all emergency situations

in emergency situations to such a point that they can be transported

Provide appropriate transportation to definitive care

prepare patients to such a point that they can be transported if necessary

so that staff members can easily fulfill their duties

to do what is required of them = Equipment and supplies are appropriate to the task and personnel

are confident and qualified to fulfill required duties

appropriate training required duties

There are appropriate levels of providers for emergency response

Equipment is mechanically sound

Equipment meets current safety standards

Equipment is properly maintained

to volunteer or medical providers

The public supports policies

levels of decision-making

emergency medical response

medical response appropriately

public understands how to access emergency medical response appropriately

emergency medical response

emergency medical response

Table 3

EFFECTIVENESS Decrease death and disability by responding effectively to medical emergencies				
EQUITY	ACCESSIBILITY	ACCEPTABILITY	RELEVANCE	EFFICIENCY
There are standard levels of service for all patients in the province.	Stakeholders have access to emergency medical response services.	Stakeholders have confidence in emergency medical response services.	Emergency medical response system quickly adapts to and adopts changes; reflects population needs.	Services are not duplicated; services are coordinated.

Throughout the framework, we use inclusive definitions of terms such as "stakeholders," "service providers," and "the public." Stakeholders include those who may be affected by changes to the emergency medical response system, such as EMS service providers, the public, employers, regional health authorities, professional associations, and other members of the health system. Service providers include those with an active role in emergency medical response service provision, such as first responders, EMTs, paramedics, dispatch centre staff, public safety agencies (i.e., law enforcement, fire services), health providers at clinics, physicians overseeing patient care and protocols, medical personnel in hospital emergency departments, and contractual partners (e.g., private ambulance companies). The public includes patients/clients, municipal leaders, and other community members.

A proposed emergency medical response system framework

The emergency medical response system framework we present in the centre spread of this document links current activities in rural emergency response to defined goals. It is based on the available evidence, input from our study working group, and interviews with key stakeholders.

According to our proposed framework, rural emergency medical response includes three functions to ensure effective response to medical emergency situations: communications, stabilization, and transportation. *Communications* activities ensure that personnel arrive at the scene of the emergency. Personnel *stabilize* the scene and the patient to the degree required to meet the immediate emergency medical needs of the patient. If required, the patient is *transported* to definitive care. Developing indicators that measure the performance of these functions will be an integral part of an overall evaluation of emergency medical response in rural Saskatchewan.

Developing indicators that measure the performance of the key functions will be an integral part of an overall evaluation of emergency medical response in rural Saskatchewan.

Because the relationships described by the framework are complex, the framework itself is complicated. To better understand the framework, insert "IF... THEN ..." between the statements. The framework provides a visual representation of the following description:

- IF people with the appropriate skills arrive at emergency situations in a timely manner, stabilize the situations to such a point that patients can be transported, and provide appropriate transportation to definitive care when needed, THEN we will have responded effectively to emergency situations.
- IF the system ensures personnel responsible for priority dispatch functions are skilled in priority assessment and communications, and emergency medical providers communicate effectively with other service providers, THEN providers with appropriate skills will arrive at emergency situations in a reasonable time.

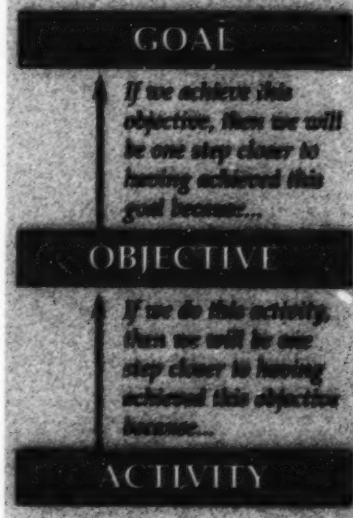
Currently, emergency response time in rural communities is defined according to public acceptability—not patient outcomes. While the goal of the system is to ensure rural residents have the same health outcomes as their urban counterparts, it would be financially prohibitive to provide the same level of response and care in all settings. Decision makers and policy makers must determine what rural residents expect in terms of emergency care, then identify how best to organize services to meet those expectations.

- IF users and potential users have consistent access to emergency medical services, and staff members have what they need (a supportive work environment and appropriate skills, equipment, and supplies) to fulfill their duties, THEN we will feel confident that we have priority dispatching.
- IF staff members are supported in their work environment, and have the necessary skills, equipment, and supplies to do what is required of them, THEN the system will have ensured that staff members can easily fulfill their duties.

Staff members need the skills to communicate with each other and other service providers, prioritize and assess situations over the phone or in person, use equipment and supplies effectively, address critical incident stress needs, and prepare and transport patients as required. These skills might also include determining when a patient does not need to be transported.

- IF providers know they are valued by their peers, employers, and users and potential users of the emergency medical response system (demonstrated by public support and fiscal decisions), and if staff members are able to build and maintain skills that

Our proposed framework is based on a program logic model. These models use a diagram to illustrate what a program does (i.e., its activities) and why (i.e., its objectives and goals). Program logic models serve as guides to improving program design or delivery. They help define what needs to be done, the sequencing of actions, and the prerequisites for change to occur.



Decision makers and policy makers must determine what rural residents expect in terms of emergency care, then identify how best to organize services to meet those expectations.

Decision makers aware of emergency medical response goals will support good policy development, consistent system access to services, and appropriate levels of funding for equipment and training.

ensure they are confident and qualified to fulfill their required duties, **THEN** the system will have provided a supportive work environment.

- Providing individuals with the appropriate training before they are hired, and educational opportunities once they are employed, will support the appropriateness of their training. **IF** there are appropriate levels of providers (both in numbers and in educational levels) for emergency response, with the appropriate training, **THEN** they will be confident and qualified to fulfill their required duties.
- **IF** the public is provided with education about emergency medical response that increases their awareness of this component of the health system, **THEN** they will support emergency medical response staff and volunteers and will understand how to appropriately access emergency medical response.
- **IF** the public supports EMS staff and volunteers, **THEN** staff will know they are valued by users and potential users of the system.
- **IF** the public understands how to appropriately access emergency medical response, **THEN** they will do so, and will take some responsibility for the system and become involved in decision-making about EMS.

Public involvement also leads to willingness on the part of individuals to train or volunteer as emergency medical providers, thereby increasing numbers of providers of emergency care. Appropriate levels of funding also support appropriate levels of providers, and the purchase and maintenance of mechanically sound equipment. Choice on the part of the public to access the emergency medical response system also increases, indirectly, the funding base for equipment and training as a portion of the system is currently funded on a user-pay structure.

What we plan to do with the framework

We will be meeting with stakeholders to discuss the goals of emergency medical response and to begin identifying how their current activities relate to those goals.

We will also be seeking input from stakeholders about appropriate indicators and measures of success in achieving goals defined for the system. This paper is intended to generate discussion about system design and evaluation, and to provide direction for future research in this area.

Recommendations

1. **Saskatchewan Health** should lead a process to identify provincial goals for emergency medical services. This would include discussing with the various EMS stakeholders—such as regional health authorities, ambulance providers, paramedics, EMTs, first responders, physicians, nurses, RCMP, and fire services—how their current activities link to the goals.
2. The new **Health Quality Council**, in consultation with key partners such as the province's regional health authorities, the Saskatchewan Emergency Medical Services Association (SEMSA) and the Saskatchewan Paramedic Association (SPA), should
 - develop standards and benchmarks for emergency medical response in rural Saskatchewan that are based on evidence-based "best practices." These standards should be based on outcomes, or on process, when evidence can link the process to population outcomes;
 - make recommendations on common tools for collecting performance data;
 - design and pilot-test tools for collecting data on performance;
 - design a uniform process for reporting data on performance; and,
 - assess current data collection in terms of reliability and validity of recommended indicators, standards, and benchmarks.
3. The **Saskatchewan Emergency Medical Services Association** (whose members respond to 95 per cent of ambulance calls in the province) and the **Saskatchewan Paramedic Association** (the professional association representing first responders, emergency medical technicians (EMT), EMT-As, and paramedics in the province) should:
 - identify current methods of measuring performance;
 - encourage sharing of tools for collecting performance data; and,
 - advocate for uniform collection and reporting of performance data.

We reviewed literature on emergency medical response strategic planning from the Canadian provinces of British Columbia and Nova Scotia, Canadian cities of Edmonton and Toronto, American states of Alaska, Arizona, and California, American counties of Alameda (CA), Chesterfield (VA), Contra Costa (CA), Gaston (NC), Hanover (VA), Loudoun (VA), and Milwaukee (WI), and San Francisco City and County (CA).

HSURC recommends the following actions be taken by stakeholders, to ensure our emergency medical response system in rural Saskatchewan makes best use of existing resources, provides value for money, and uses people and resources efficiently, and to identify what activities are effective:

- Agree on goals of emergency medical response
- Define measures of success in achieving goals
- Identify existing tools for collecting data, or develop new ones
- Collect and analyze reliable and valid data

Selected references

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Further information

This is the fourth in a series of Issues and Directions papers. The papers are intended to highlight for discussion rather than definitively examine topical issues. They present an overview of the available literature, an informal assessment of the Saskatchewan environment, and general recommendations to improve quality and effectiveness.

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